

Summarized Translation of Prior Document 5

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Applicant: Toray Industries, Inc., Tokyo, Japan

Inventors: Koichi ABE et al., Japanese citizens

Title of Invention: Polyamide film for packaging

Claim (Sole claim):

1. A polyamide film for packaging containing 1.0 to 13.0% by mole of at least one metal halide.

Abstract:

The invention relates to polyamide films for packaging with a small gas permeability (below half of the gas permeability of original polyamide film).

Metals of the metal halides to be contained in the polyamide film may include those of Ia to VIIa groups, Ib to IVb groups and VIII group in the periodic table. Halogens of the metal halides may include those of VIIB group in the periodic table. Examples of the metal halides may include cobalt chloride, copper chloride and copper bromide.

If the content of metal halide in the polyamide film is below 1.0% by mole, the film can not have small gas permeability. The content is preferably not less than 4% by mole. If the content is over 13.0% by mole, the gas permeability of the film is rapidly increased.

The polyamide used may include aliphatic polyamides, such as nylon-6, -66, -11, -12 and copolymer thereof, and aromatic polyamides, such as polyhexamethyleneisophthalamides, polyhexamethylene(isophthalamide/terephthalamide) copolymers,

polymetaxylyleneadipamides, poly(metaxylylene/paraxylylene)adipamides, and mixtures thereof.

The metal halide may be added before, during or after the polymerization of polyamide, or to powders of polyamide. Alternatively, the metal halide is added by immersing a polyamide film into a solution of the metal halide.

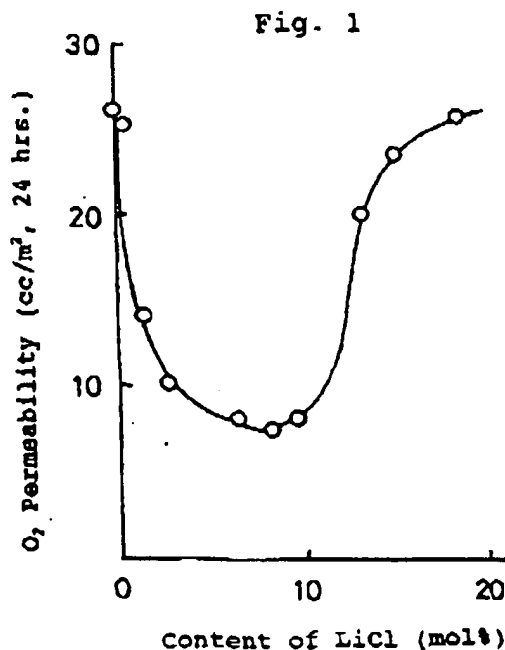
The film of the invention is in the form of a layer or of multiple laminated layers. The film may be laminated with a layer of polymer, e.g. polyamide, such as nylon-6, -66, -610, -612, -11, -12 or polymetaxylyleneadipamide, polyolefin, such as polyethylene or polypropylene, or modified polyolefin, and an optional adhesive layer.

The film of the invention has very small gas permeability due to an interaction between the metal halide and the polyamide obtained by strictly specifying the kind and the content of metal halide contained in the film.

The film of the invention may be used for packing a food or drug which is required to be protected from its oxidation.

Example 1:

A film containing 6.3% by mole of lithium chloride was prepared by adding lithium chloride to nylon-6 powders (Relative Viscosity: 2.4 at 25°C). Figure 1 below shows the relation between the oxygen permeability and the lithium chloride content of the film thus obtained.



Example 2:

A laminated film having three layers was prepared wherein both the outer layers were made of nylon-610 with no lithium chloride and the inner layer was made of nylon-6 with lithium chloride in an amount of 8.0% by mole. The laminated film had a total thickness of 15 μm (each of the outer layers: 3 μm ; the inner layer: 9 μm) and a oxygen gas permeability of 9.8 cc/m².24hrs.

Examples 3 to 5 and Comparative Examples 1 and 7:

Films were prepared in the same procedures in the above. Analytical results of the films obtained in these Examples and comparative Examples are shown in Tables 1 and 2 below.

Table 1

	Inner Layer Composition			Outer Layer Material	Oxygen Permeability*
	Polymer	Additive	Content of Additive in Inner Layer (mol%)		
Example 3	Nylon-6	Calcium Chloride	6.5	Nylon 610	33
Comparative Example 1	Nylon-6	Calcium Chloride	15.0	Nylon 610	93
Comparative Example 2	Nylon-6	Calcium Chloride	0.2	Nylon 610	100
Comparative Example 3	Nylon-6	Calcium Sulphate	6.6	Nylon 610	100
Comparative Example 4	Nylon-6	Titanium Oxide	6.5	Nylon 610	100
Comparative Example 5	Nylon-6	None	0	Nylon 610	100

*NOTE: Oxygen Permeability is expressed as a relative value when the permeability of a film with no additive is 100.